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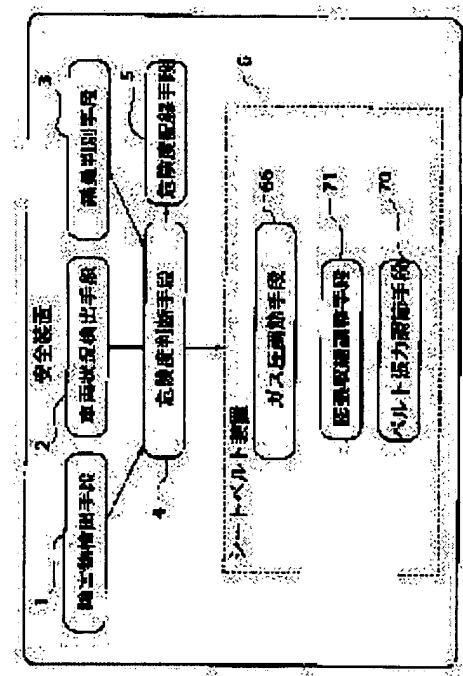
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## (54) SAFETY DEVICE FOR VEHICLE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a safety device recognizing a fault event around a vehicle or the vehicle itself, predicting a risk of the fault event and warning occupants, and applying more precise protection to the occupants.

**SOLUTION:** This safety device is provided with an obstacle detecting means 1 detecting an obstacle around one's vehicle, a vehicular situation detecting means 2 detecting situations of one's vehicle such as speed, acceleration, rolling over, sudden braking, sudden turning, or a side skid, and a risk judging means 4 judging a risk level of the obstacle toward one's vehicle and/or a risk level of one's vehicle alone on the basis of information received from the obstacle detecting means 1 and/or the vehicular situation detecting means 2. Also, it is provided with a seat belt device 6 having belt adjusting means 66, 70, and 71, and changes an area and/or shape of a contacting part of a belt and an occupant in accordance to a risk level information from the risk judging means 4. Furthermore, it is provided with an occupant distinguishing means 3 detecting or storing physical characteristics of an occupant sitting in a seat corresponding to the seat belt device 6.



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## CLAIMS

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## [Claim(s)]

[Claim 1] (A) An obstruction detection means to detect the obstruction around self-vehicles, the speed of (B) self-vehicles, A vehicles situation detection means to detect situations, such as acceleration, a sideslip, sudden braking, a steep turn, and a sideslip (C) A danger judging means to judge the dangerous level of the obstruction to self-vehicles, and/or self-vehicles independent dangerous level in response to the information from the above-mentioned obstruction detection means and/or a vehicles situation detection means, And the safety device of the vehicles characterized by providing the seat belt equipment which has a belt adjustment means prepared in (D) self-vehicles to be seat belt equipment and to change the area and/or the configuration of the contact section of a belt and crew according to the dangerous level information from the above-mentioned danger judging means.

[Claim 2] (E) Seat belt equipment according to claim 1 characterized by providing further a crew distinction means to memorize whether the stigma of crew sitting on the sheet corresponding to the above-mentioned seat belt equipment is detected, and for the above-mentioned belt adjustment means receiving the information on a crew distinction means, and changing the area and/or the configuration of the contact section of a belt and crew according to the stigma of the crew on this sheet.

[Claim 3] (A) An obstruction detection means to detect the obstruction around self-vehicles, the speed of (B) self-vehicles, A vehicles situation detection means to detect situations, such as acceleration, a sideslip, sudden braking, a steep turn, and a sideslip (C) A danger judging means to judge the dangerous level of the obstruction to self-vehicles, and/or self-vehicles independent dangerous level in response to the information from the above-mentioned obstruction detection means and/or a vehicles situation detection means, (F) Seat belt equipment which has a belt adjustment means prepared in self-vehicles to be seat belt equipment and to change the tension of a belt according to the dangerous level information from the above-mentioned danger judging means, And a crew distinction means to memorize whether the stigma of crew sitting on the sheet corresponding to the (E) above-mentioned seat belt equipment is detected, Seat belt equipment characterized by \*\*\*\*\*ing, and for the above-mentioned belt adjustment means receiving the information on a crew distinction means, and changing the area and/or the configuration of the contact section of a belt and crew according to the stigma of the crew on this sheet.

[Claim 4] The safety device of the vehicles according to claim 1, 2, or 3 characterized by having a means by which the above-mentioned obstruction detection means detects the distance and relative velocity of an obstruction and self-vehicles, calculating time until the above-mentioned danger judging means collides based on the approach state of an obstruction and self-vehicles, and judging the above-mentioned dangerous level according to the time.

[Claim 5] It has the sensor by which the above-mentioned vehicles situation detection means measures at least one or more of the acceleration of right and left and the vertical direction, and the angular velocity of the circumference of each aforementioned direction before and after self-vehicles. The above-mentioned danger judging means Usual run states, such as start of \*\* self-vehicles, acceleration, revolution, and braking, \*\* The safety device of the vehicles according to claim 1, 2, or 3 characterized by judging four dangerous level of a dangerous state with a possibility that unstable states, such as sudden braking, a steep turn, and a sideslip, \*\* collision, a sideslip, spin, etc. may arise, and accident state [ which the collision, the sideslip, etc. produced in \*\* reality ] \*\*.

[Claim 6] Furthermore, the above-mentioned danger judging means is the safety device of the vehicles according to claim 5 characterized by having the Records Department which pursues and records a start and end of the above-mentioned everything elephant.

[Claim 7] The safety device of the vehicles according to claim 2 or 3 characterized by providing a read-out means by which the above-mentioned crew distinction means reads the stigma information of an individual authentication means to specify the crew who sat on each sheet, the database which memorizes the individual stigma information registered beforehand, and the crew specified by the above-mentioned individual authentication means from a database.

[Claim 8] The safety device of the vehicles according to claim 1, 2, or 3 with which the above-mentioned seat belt equipment is characterized by adjusting the tension, contact aspect product, and/or configuration of a belt, and notifying the present dangerous level to crew according to the collision dangerous level and the self-vehicles dangerous level information which the above-mentioned danger judging means emits.

[Claim 9] The safety device of the vehicles according to claim 2 or 3 characterized by the above-mentioned seat belt equipment choosing the combination (the crew protection method) of the tension of a belt, a contact aspect product, and/or a configuration according to crew's stigma acquired from the collision dangerous level, self-vehicles dangerous level information, and crew distinction means which the above-mentioned danger judging means emits.

[Claim 10] It is the safety device of the vehicles according to claim 1, 2, or 3 with which the belt adjustment means of the above-mentioned seat belt equipment is characterized by having the seat belt which has the saccate section in which the contact section with crew was prepared in part at least, and in which it is usually maintained by band-like at the time, and the belt expansion contraction means which exhausts gas while introducing gas and expanding it in this saccate section, and is returned to band-like.

[Claim 11] Furthermore, the safety device of the vehicles according to claim 10 characterized by having a gas-pressure-adjusting means to adjust the pressure of the gas to introduce.

[Claim 12] The above-mentioned expansion contraction means is the safety device of the vehicles according to claim 1, 2, or 3 characterized by having a means to become independent or interlock, and to shrink [ shrink, and shrink, the interior is divided into at least two or more partitions, and the saccate section of the above-mentioned seat belt equipment expands ] each partition, and a means to adjust the drift velocity and the pressure of gas in case gas is introduced or exhausted to each partition.

[Claim 13] The safety device of the vehicles according to claim 12 characterized by ending introduction if gas is introduced and pressurized and it consists of the exterior more than fixed when the above-mentioned gas-pressure-adjusting means is equipped with the gas storage section, this gas storage section is usually maintained to the internal pressure more than fixed and a pressure value becomes below fixed.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] It recognizes the obstacle event of the vehicles circumference or the vehicles itself, and this invention predicts the danger of the obstacle event, and an alarm is given to crew or it relates to the safety device which protects to crew.

[0002]

[Description of the Prior Art] In recent years, obstructions, such as front vehicles, are detected using a radar installation etc., the collision with the obstruction is predicted, warning is given to an operator or the collision prevention equipment which a damping device is operated and brakes the vehicle speed is developed. As a means to give warning, an alarm tone is issued to a driver, or the warning light is turned on and blinked to him. However, by disturbance, such as a state of an operator's operation, an athletic ability or a run state, a road surface situation, and in-the-car environment, it may fail to hear an alarm tone or a warning light may be overlooked. Moreover, even if it perceives warning, it may be unable to correspond according to an above-mentioned situation.

[0003] In such emergency, by evasion operation of a driver, vehicles may cause a steep turn, a sideslip, etc. and may cause a sideslip and a collision. Protective devices, such as conventional seat belt equipment and an air bag, were not what operates when self-vehicles collide, starts protection of crew and operates corresponding to the unstable run state of a self-vehicle.

[0004] When a collision is predicted by JP,10-306392,A and it is judged that the possibility is high, the equipment which operates automatically the belt drawing-in mechanism of seat belt equipment is indicated by it. This seat belt equipment will apply a pulley tension to a belt by making belt tension into strength, if it has a collision precognition sensor and a collision is foreknown. This equipment detects the acceleration of a hand of cut further, when it is likely to result in the state where rotation of vehicles and a driver's operation function are spoiled, it rolls a belt strongly, takes sag (slag), and fixes crew to a sheet. Thus, risk can be made to be able to perceive certainly by giving somesthesia-warning to crew, and the protection can be given further simultaneously.

[0005] However, the seat belt equipment currently indicated by this JP,10-306392,A cannot adjust the area and the configuration of a belt. moreover, the thing which offers the protection according to crew's stigma -- yes [ be / it ]

[0006] The obstruction around self-vehicles is detected also to JP,7-81520,A, the degree of obstacle to the self-vehicles of this obstruction is judged to it, and the seat belt equipment which can be adjusted is proposed according to the result. That is, belt tension is enlarged, so that the degree of obstacle is high, crew can be made to be able to feel, information can be ensured, and protection of crew can be aimed at in advance still more nearly simultaneous.

[0007] However, the seat belt equipment currently indicated by this JP,7-81520,A cannot adjust the area and the configuration of a belt, either. moreover, the thing which offers the protection according to crew's stigma -- yes [ be / it ]

[0008] Inflator belt seat belt equipment is proposed by JP,5-112201,A etc. as what makes restraint nature of seat belt equipment more reliable. With the seat belt of this invention, the saccate section is prepared in the portion which contacts crew's shoulder. Gas is poured into emergency from a generation-of-gas means, and this saccate section expands, and can respond to crew's kinetic energy in latus belt area more.

[0009] However, the protection according to precognition of a collision or crew's stigma is not described by this proposal.

[0010] The seat belt equipment of many above-mentioned proposals can be contributed on the safe disposition of the crew of vehicles, respectively. However, the safety device which can provide crew with more exact protection is called for.

[0011] this invention recognizes the obstacle event of the vehicles circumference or the vehicles itself, and it predicts

the danger of the obstacle event, and an alarm is given to crew or it aims at offering the safety device which gives exact protection by crew.

[0012]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the safety device of the 1st mode of this invention An obstruction detection means to detect the obstruction around (A) self-vehicles Speed of (B) self-vehicles, A vehicles situation detection means to detect situations, such as acceleration, a sideslip, sudden braking, a steep turn, and a sideslip A danger judging means to judge the dangerous level of the obstruction to self-vehicles, and/or self-vehicles independent dangerous level in response to the information from the (C) above-mentioned obstruction detection means and/or a vehicles situation detection means, It reaches. It is characterized by providing the seat belt equipment which has a belt adjustment means prepared in (D) self-vehicles to be seat belt equipment and to change the area and/or the configuration of the contact section of a belt and crew according to the dangerous level information from the above-mentioned danger judging means.

[0013] Since the configuration and area of the contact section of a seat belt and crew are adjusted according to the judged danger, exact protection can be given by crew.

[0014] In the safety device of this mode A crew distinction means to memorize whether the stigma of crew sitting on the sheet corresponding to the (E) above-mentioned seat belt equipment is detected is provided further. It is desirable that the above-mentioned belt adjustment means receives the information on a crew distinction means, and is characterized by changing the area and/or the configuration of the contact section of a belt and crew according to the stigma of the crew on this sheet. Suitable protection can be given according to crew's stigma. Thereby, the force which gets across to crew, a pressure, and crew's restricted condition can be made more desirable.

[0015] That is, to the tolerant high crew to expansion of a seat belt, weak expansion force is given for strong expansion force to low crew based on information peculiar to each people, such as intensity of a skeleton judged from crew's height, the size of the body judged from weight, age, sex, etc., a stigma [ need / to be considered specially / still / at the time of a seat belt operation ], and condition of disease. Thereby, more suitable protection can be offered, without applying a burden to crew's body.

[0016] An obstruction detection means by which the safety device of the vehicles of the 2nd mode of this invention detects the obstruction around (A) self-vehicles, A vehicles situation detection means to detect situations, such as the speed of (B) self-vehicles, acceleration, a sideslip, sudden braking, a steep turn, and a sideslip A danger judging means to judge the dangerous level of the obstruction to self-vehicles, and/or self-vehicles independent dangerous level in response to the information from the (C) above-mentioned obstruction detection means and/or a vehicles situation detection means, The seat belt equipment which has a belt adjustment means prepared in (F) self-vehicles to be seat belt equipment and to change the tension of a belt according to the dangerous level information from the above-mentioned danger judging means, It reaches. A crew distinction means to memorize whether the stigma of crew sitting on the sheet corresponding to the (E) above-mentioned seat belt equipment is detected, is provided. The above-mentioned belt adjustment means receives the information on a crew distinction means, and is characterized by changing the area and/or the configuration of the contact section of a belt and crew according to the stigma of the crew on this sheet.

[0017] It is judged and suitable protection can be given according to danger. Moreover, according to crew's stigma, weak tension is given to the crew of strong resistance for strong tension to weak crew to seat belt tension. A thereby more thoroughgoing protection performance can be offered.

[0018] In the safety device of the vehicles of this invention The above-mentioned vehicles situation detection means Before or after self-vehicles, It has the sensor which measures at least one or more of the acceleration of right and left and the vertical direction, and the angular velocity of the circumference of each aforementioned direction. The above-mentioned danger judging means Usual run states, such as start of \*\* self-vehicles, acceleration, revolution, and braking, A dangerous state with a possibility that unstable states, such as \*\* sudden braking, a steep turn, and a sideslip, a \*\* collision, a sideslip, spin, etc. may arise, accident state which the collision, the sideslip, etc. produced in \*\* reality It is desirable to judge four dangerous level.

[0019] By detecting the size of the direction where self-vehicles have received the load, or a load, and classifying dangerous level, the area and the configuration of the tension of a seat belt and the contact section with the body can be more exactly adjusted according to the level of the emergency which encounters.

[0020] Furthermore, it is also desirable to have the Records Department which pursues and records a start and end of the above-mentioned danger judging means above-mentioned everything elephant. Record can be used for a subsequent accident verification etc.

[0021] In the vehicles safety device of this invention The belt adjustment means of the above-mentioned seat belt equipment It is the seat belt which has the saccate section in which the contact section with crew was prepared in part at least, and by which it is usually maintained by band-like at the time. Belt expansion contraction means which exhausts

gas and is returned to band-like while introducing gas and expanding it in this saccate section. It is characterized by having.

[0022] Suppose that it has a gas-pressure-adjusting means to adjust the pressure of the gas to introduce at this time. Furthermore, as for the saccate section of the above-mentioned seat belt equipment, the interior is divided into at least two or more partitions. The above-mentioned expansion contraction means A means to become independent or interlock, and to expand or shrink each partition. In case you introduce or exhaust gas to each partition, suppose that it has a means to adjust the drift velocity and the pressure of gas. Further The above-mentioned gas-pressure-adjusting means is equipped with the gas storage section. Suppose that introduction is ended, if gas is introduced and pressurized and it consists of the exterior more than fixed, when this gas storage section is usually maintained to the internal pressure more than fixed and a pressure value becomes below fixed.

[0023] If the saccate section formed in the belt in emergency is expanded, since the tension and the pressure of a belt, and the area and the configuration of the contact section with crew will change, the force which gets across to crew, a pressure, and crew's restricted condition can be made more desirable. Furthermore, information to crew's tactile sense and visual sense, and an acoustic sense can also be performed. Therefore, a driver can perceive emergency certainly and can perform evasion operation. Moreover, crew can be taken care of to braking movement of the vehicles accompanying evasion operation.

[0024] In this invention The above-mentioned crew distinction means An individual authentication means to specify the crew who sat on each sheet Database which memorizes the individual physical feature information registered beforehand Read-out means which reads from a database crew's physical feature information specified by the above-mentioned individual authentication means It is characterized by providing.

[0025] The crew who sits on each sheet can be specified and the seat belt equipment which accompanies the sheet can be appropriately adjusted by grasping the crew's physical feature for every sheet according to the physical feature.

[0026]

[Embodiments of the Invention] Hereafter, it explains, referring to a drawing. Drawing 1 is drawing showing the system configuration of the safety device concerning one example of this invention. The safety device 10 consists of the obstruction detection means 1, the vehicles situation detection means 2, the crew distinction means 3, a danger judgment means 4, a danger record means 5, and seat belt equipment 6.

[0027] The data from the obstruction detection means 1, the vehicles situation detection means 2, and the crew distinction means 3 are inputted into the danger judgment means 4 which consists of CPUs. With the danger judgment means 4, from the obstruction information and the vehicles situation of having been inputted, danger is judged, and further, seat belt equipment 6 is adjusted and is operated so that the warning and protection suitable for the physique and property of the crew distinguished with the crew distinction means 3 according to the judged danger may be given. In addition, in the case of the above-mentioned danger judging, it can also judge only based on the information from either the above-mentioned obstruction detection means 1 or the vehicles situation detection means 2.

[0028] Each system of the safety device concerning this example is explained in detail. The obstruction detection means 1 detects a front obstruction, the relative distance to self-vehicles and an obstruction is measured, and a radar installation, stereoscopic camera equipment, etc. are used. The relative velocity for every time is computed from the measured relative distance. If relative velocity is decreasing, both will desert, the situation which keeps away from an obstruction is shown, and if it is increasing, both approach and show the situation whose danger increases. A relative distance and relative velocity are inputted into the danger judgment means 4, and the possibility of a collision is judged.

[0029] Drawing 2 is drawing showing the relation of the value and collision possibility which were detected with the obstruction detection means. In this drawing, a vertical axis expresses relative velocity and a horizontal axis expresses a relative distance. If relative velocity is decreasing, almost regardless of a relative distance, it will become the field of warning needlessness. That is, it is not necessary to perform emergency measures, such as sudden braking and a steep turn, in the situation which both leave mutually. However, by positive, when a relative distance is remarkable and short, relative velocity is the situation of colliding and serves as a field of a conflict alert. That is, when both approach rapidly and both distance approaches remarkably further, possibility of resulting in a collision is high. Moreover, it becomes a collision warning field between a warning unnecessary field and a conflict-alert field as a field which can avoid a collision by giving warning.

[0030] Drawing 3 is drawing showing typically the behavior of the vehicles detected by the vehicles situation detection means. The vehicles situation detection means 2 is a sensor which detects the acceleration of right and left and the vertical direction, and the angular velocity of the circumference of each aforementioned directional axis before and after self-vehicles. Here, the rotation to which the rotation to which the rotation in alignment with the cross-direction shaft met the roll (revolution) and the lateral axis met the pitch (pitching) and the normal axis is called yaw. It asks for aging of each detected data, and compares with the data in a normal state. In a normal state, although each value changes

smoothly, a rapid acceleration change takes place in emergency. For example, when operating a slam on the brake, the acceleration of front decreases rapidly, and at the time of revolution of vehicles, the acceleration to the opposite direction of the revolution direction is detected by the roll sensor. Moreover, when spin is carried out in a curve, the angular velocity of a yaw sensor becomes more than fixed, and the change in the acceleration of a cross direction and a longitudinal direction synchronizes. In a sideslip, it is detected by the angular velocity and time of a roll sensor. The detected value is inputted into the danger judgment means 4.

[0031] The crew distinction means 3 specifies the crew who sat on each sheet, the crew's physical feature information is called, and a fingerprint sensor, an ID card, etc. which were prepared in the buckle of a seat belt are used. The physical features, such as crew's height, weight, age, and sex, are beforehand memorized by the database. Therefore, when crew gets on, a fingerprint is read by the fingerprint sensor, or an ID card is inserted, an individual is specified, and the information of the individual who corresponds from a database is called. The called data are inputted into the danger judgment means 4.

[0032] Drawing 4 is the \*\* type view showing the state where the fingerprint sensor was attached in the buckle of a seat belt. The fingerprint sensor 30 is formed in the buckle 32 of a seat belt 31, and one. This buckle 32 is supported with the left hand, when equipping with a seat belt 31, and the tongue 33 of a seat belt which it had in the right hand is inserted in. The slot 34 is formed in the side of a buckle 32 so that it may be easy to grasp. The shallow impression 35 on which the thumb is put is formed in the upper surface, and the detection side of a fingerprint sensor is located here. If four fingers other than the thumb are put into a slot 34, the thumb will become depressed in the natural state, it will be put on 35, and the fingerprint of the thumb will be detected.

[0033] Drawing 5 is the block diagram of the computer which constitutes the crew distinction means equipped with the fingerprint sensor of drawing 4 . The computer is constituted by the central-process section 80, the fingerprint input section 90, the information input section 100, and the storage section 110 grade.

[0034] The information input section 100 has the input units 101, such as a keyboard, and the physical features, such as weight and height of the crew who got permission of the owner of vehicles, a family, etc., and age, are inputted for every crew. The inputted information is memorized by the personal information data-storage section 111 of the storage section 110. Moreover, above-mentioned crew's fingerprint data inputted from the separate fingerprint sensor 102 are registered into the fingerprint data-storage section 112. The seat belt equipment optimizer 113 is memorized by the storage section 110. This program controls seat belt equipment according to crew's physical feature saved in the personal information data-storage section 111 to change the expansion degree of the tension of seat belt equipment, or the saccate section.

[0035] The fingerprint input section 90 is equipped with the fingerprint sensor 30 and the fingerprint collation device 91. It is judged whether you are the crew who the fingerprint read by the fingerprint sensor 30 was collated with the fingerprint data memorized by the fingerprint data-storage section 112 by the fingerprint collation device 91, and was registered.

[0036] Therefore, if crew's fingerprint is read by the fingerprint sensor 30 of the fingerprint input section 90, it will collate with the fingerprint data saved in the fingerprint data-storage section 112 with a fingerprint collation device 91. If it collates and crew is specified, the crew's physical feature will be called from the personal information data-storage section 111. And according to this physical feature, seat belt equipment 6 is appropriately operated by the seat belt equipment optimizer 113. This processing is controlled according to the control program 81 of a central processing unit 80.

[0037] Drawing 6 is drawing showing typically the composition of the seat belt equipment concerning this example. Seat belt equipment 6 is the inflator belt seat belt by which the saccate sections 61 and 62 were respectively formed in the portion which touches a shoulder strap's both-sides-of-the-head section and thorax of crew. The buckle 63 is formed in the edge of the lower part of a shoulder strap. This buckle is being fixed to the sheet. On the other hand, the upper edge of a belt is prolonged upwards from crew's thorax and the both-sides-of-the-head section, is deflected downward with a deflector (not shown), and, finally is being fixed to the body. In the both-sides-of-the-head section saccate section 61 and the thorax saccate section 62, the pipes 64 and 65 for supplying the gas for expansion have connected with each part, and each saccate section can be expanded separately. Pipes 64 and 65 are connected to the tank 67 of expansion gas (air) through the gas-pressure-adjusting means 66. In addition, pressurization air is supplied to this tank 67 from a mounted compressor etc.

[0038] Drawing 7 is drawing showing the structure of the saccate section of a shoulder strap typically, and the front view in the state where (A) was folded up, the front view in the state where (B) was developed, the cross section in the state where (C) was folded up, and the cross section in the state where (D) was developed are shown. The saccate section 60 closes two cloth of a longwise hexagon shown in drawing 7 (B) along with a periphery. These \*\*\*\* have air sealing nature by non-elasticity. Usually, at the time, two corners 60a and 60b which right and left of the hexagon of

these cloth counter are inserted in between two cloth, as shown in drawing 7 (C). In the usual state (folded-up state), as shown in drawing 7 (A), it is a belt-like. If expansion gas (air) is supplied to the saccate section, the corners 60a and 60b folded up as shown in drawing 7 (B) will be opened outside, and the whole saccate section will expand simultaneously. The both-sides-of-the-head section side saccate section which expanded forms space between crew's both-sides-of-the-head section and the body, and reduces a side collision, and a sideslip and the obstacle by the both-sides-of-the-head section being equivalent to the body in the case of a rapid horizontal shake. Moreover, the thorax side saccate section which expanded reduces the obstacle by the elutriation ahead of crew while protecting crew's thorax.

[0039] Furthermore, these saccate sections can expand in two stages of the warning expansion for telling crew about a state of emergency, and the full expansion which protects crew from a collision. That is, in warning expansion, the thorax saccate section is expanded by the pressure (first-stage story) of the grade which can be felt to crew, and it warns of it being a state of emergency. In full expansion, a thorax and the saccate section of the temporal region are expanded completely (the second phase), and crew's thorax and temporal region are protected. Adjustment of this expansion state is performed by the gas-pressure-adjusting means 66, such as an adjustable reducing valve or a cross valve.

[0040] Drawing 8 is drawing showing change of gas holder internal pressure. In this drawing, a vertical axis expresses the internal pressure of a gas holder, and a horizontal axis expresses time. By the initial states at the time of a parts replacement etc., the inside of a gas holder is kept of the same grade as atmospheric pressure at the time of factory shipments (A1). If vehicles depart, the gas-pressure-adjusting means 66 will incorporate air in a gas holder 67 by the compressor etc. from an inlet port 68 (A2), and will hold the inside of a gas holder in a pressurization upper limit (A3 [2], for example, 3 kgf/cm). When performing warning expansion, gas is supplied to the saccate section until the inside of a gas holder becomes a pressurization lower limit, for example, a value a little higher than 2 kgf/cm<sup>2</sup>, (A4). At this time, the saccate section expands on a first-stage story, and gas holder internal pressure is held at this value (A5). Next, when performing formal expansion, gas is supplied to the saccate section until the inside of a gas holder serves as a value a little lower than a reduced pressure lower limit (A6 [2], for example, 1 kgf/cm). At this time, the saccate section expands in the second phase which added the gas supplied to the gas supplied by A4 by A6. Then, air is again incorporated from an inlet port (A7), and the inside of a gas holder is held to a predetermined value (A8).

[0041] Release of warning exhausts the gas of saccate circles from an exhaust port 69 through a gas-pressure-adjusting means after warning expansion. Moreover, the saccate section has the function to memorize a band-like (drawing 7 (A), (C)) configuration, and if internal air is extracted and decompressed, it will return to band-like [ original ]. In addition, at least about two 0.4 - 0.6 kgf/cm of the pressure at the time of formal expansion of belt saccate circles is enough.

[0042] The saccate section of a seat belt has air sealing nature, and may be made from material like rubber with elasticity. In this case, need to fold up the saccate section, and it is not necessary to form it, and usually expands from the form at the time, and if air is extracted, it will return to the original configuration.

[0043] Next, processing of a danger judgment means is explained. Drawing 9 is a flow chart which shows processing of a danger judgment means. First, in S10, by the crew distinction means, the crew who got on is specified and personal information, such as the crew's physical feature, is called. Next, by S11, by the obstruction detection means, a front obstruction is detected and relative velocity and a relative distance with self-vehicles are computed. From this relative velocity and a relative distance, it judges whether it is a warning unnecessary field by S12 based on the correlation diagram of drawing 2. If it is a warning unnecessary field, it will consider that it is usually a run state, and will progress to S13, all will be initialized, and it will be ended.

[0044] By S12, if it is not a warning unnecessary field, it will progress to S14 and will judge whether it is a collision warning field. If it is a collision warning field, it will progress to S15 and the output value of each sensor detected with a vehicles situation detection means will be read. With [ here / any sensor value ] a threshold [ below ], it considers that it is a little unstable run state, and it progresses to S16, warning expansion of the thorax saccate section of a seat belt is carried out, and crew's attention is called.

[0045] With [ S15 / one of sensor values ] thresholds [ more than ], it progresses to S17 and the value of a roll sensor and a yaw sensor is compared with a threshold. While with [ one of values ] thresholds [ more than ] progressing to S18, judging that the sideslip of vehicles and the possibility of spin are high, considering that it is in a dangerous state, expanding the thorax and the head saccate section of a seat belt by S19 and calling crew's attention, crew is stably fixed to a sheet. While will be more than a threshold and it judges that operation of a slam on the brake and the revolution to the front may take place by S20, and a pitch sensor value considers that it is in a dangerous state similarly, expands the thorax saccate section of a seat belt by S21 and calls crew's attention by S17 with [ each of roll sensor values and yaw sensor values ] thresholds [ below ], the obstacle by the elutriation ahead of crew is reduced.

[0046] By S14, if it is not a collision warning field, it will progress to S22 and will become a conflict-alert field. S23 compares with the threshold of the roll sensor value of a sensor value, and a yaw sensor value. With [ one of values ] thresholds [ more than ], vehicles are in the state of sensing the acceleration of a rapid longitudinal direction, and it is

judged by S24 that the possibility of a side collision or a sideslip is high. At this time, the thorax and the temporal-region saccate section of a seat belt are expanded by S25, and the obstacle by crew's elutriation and temporal region to the front contacting the body is reduced.

[0047] With [ S23 / a roll sensor value or a yaw sensor value ] a threshold [ below ], it is judged that the possibility of a head-on collision is high at S26. At this time, the thorax saccate section of a seat belt is expanded by S27, and the obstacle by the elutriation ahead of crew is reduced.

[0048] In addition, expansion of the saccate section is adjusted by the expansion contraction means 71 according to the stigma of the crew called by S10. Furthermore, seat belt equipment 6 has the belt tension adjustment means 70, and adjusts tension according to a stigma. In full expansion, the expansion degree of the thorax saccate section of seat belt equipment is so large that it is generally well-built, the expansion degree of the temporal-region saccate section is large, and belt tension is set up highly. In warning expansion, it is set up by each \*\*\*\* lower than full expansion.

[0049] The danger record means 5 records the value detected by the relative velocity computed from the obstruction detection means 1, the relative distance, the roll sensor of the vehicles situation detection means 2, the yaw sensor, and the pitch sensor. This information is used for verification of accident etc.

[0050]

[Effect of the Invention] According to this invention, the obstacle event of the vehicles circumference or the vehicles itself can be recognized, the danger of the obstacle event is predicted, an alarm can be given to crew or the safety device which gives exact protection by crew can be offered so that clearly from the above explanation.

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[Translation done.]

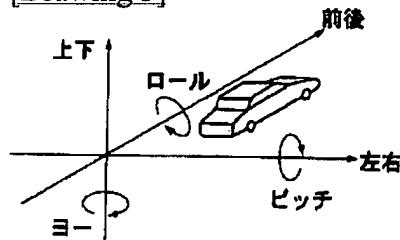
## \* NOTICES \*

Japan Patent Office is not responsible for any damage caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

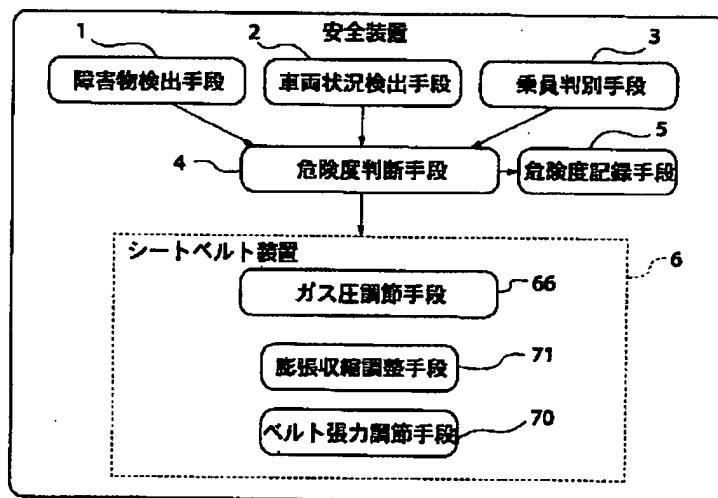
## DRAWINGS

## [Drawing 3]

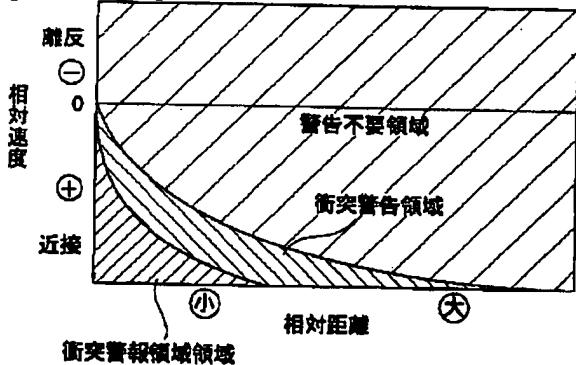


## [Drawing 1]

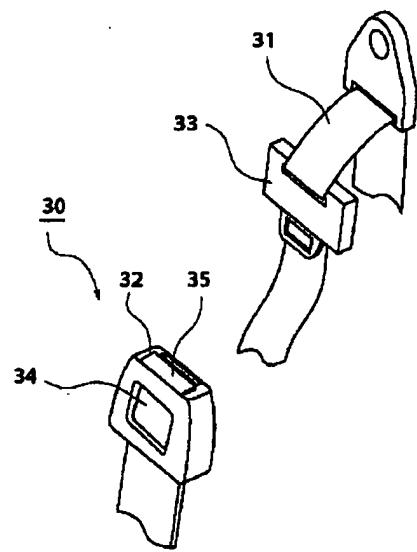
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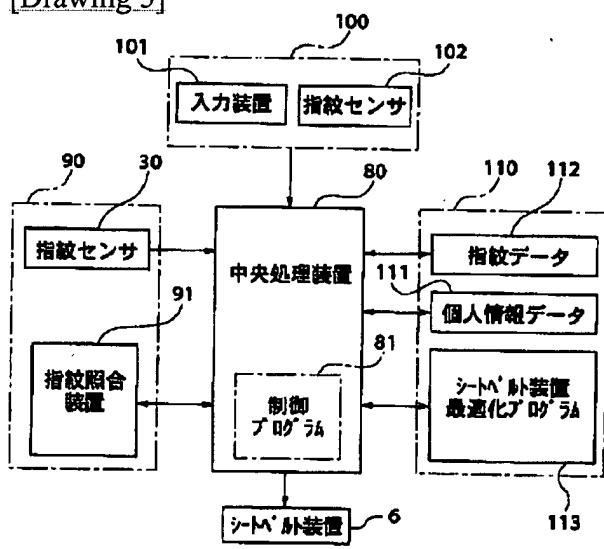
## [Drawing 2]



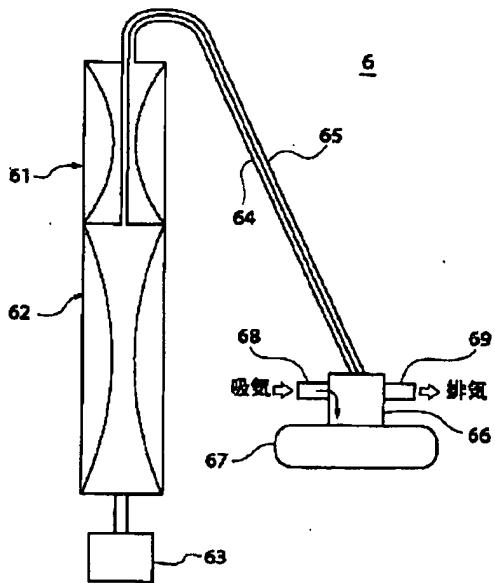
## [Drawing 4]



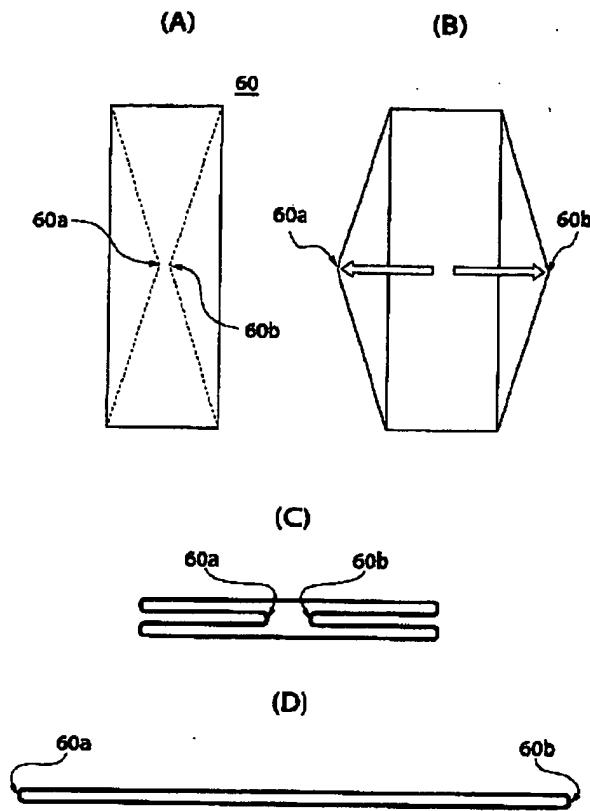
[Drawing 5]



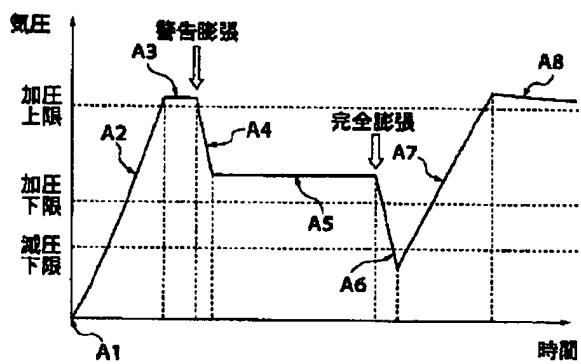
[Drawing 6]



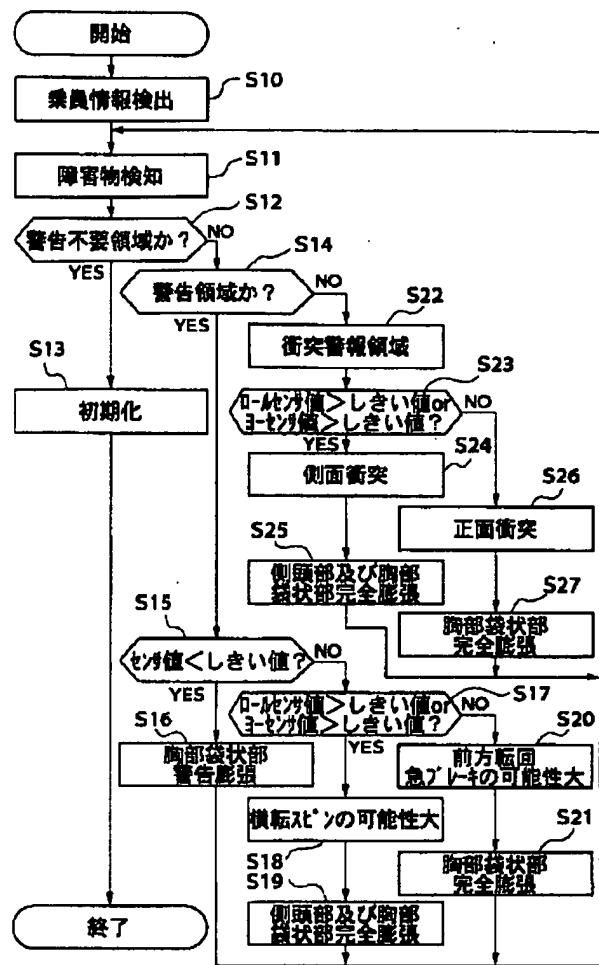
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]